Perioperative Guidelines For Surgery On The Edematous Limb

By Wade Farrow, MD

Individuals with lymphedema often are hesitant about undergoing elective surgical procedures; concern exists regarding the potential for worsening their condition or the development of an infection. Likewise, surgeons may be reluctant to recommend or perform surgery on lymphedema patients, being concerned that the patient may develop complications. Many excellent surgeons are not familiar with methods to reduce the risk of these complications. Lymphedema is a chronic condition; the reality is that many lymphedema patients will need to undergo surgery or invasive procedures electively or non-electively at some point.

Surgery on an edematous limb can result in increased risk of wound dehiscence, blood clot formation (in case of lower limbs), infection and impaired wound healing. There are many causes of edema and it is important for the physician to properly diagnose the patient, as well as understand the etiology of the edema when planning the surgical procedure. The diagnosis and underlying causes of edema are beyond the scope of this paper. This article will focus on perioperative recommendations to reduce the risk of complications for patients with lymphedema, lympho-venous edema, or chronic venous insufficiency who require surgery. Reducing the edema preoperatively, perioperatively and postoperatively can significantly decrease risk of surgical complications.

Lymphedema is characterized by the accumulation of protein-rich fluid. To prevent irreversible tissue changes, the standard of care is Complete Decongestive Therapy (CDT), which includes Manual Lymph Drainage (MLD), short-stretch bandaging, compression garments, exercise, and skin care. The goal of CDT is to reduce as much fluid as possible in the affected area(s), to improve lymphatic flow and to prevent fluid re-accumulation. Reduction of static lymph fluid in the tissues will help to reduce postoperative complications and worsening of the swelling.

1. Mechanical forces pulling wound edges apart. This occurs due to the hydrostatic pressure of the tissue fluid causing progressive stretching of the skin and tissues, resulting in increased risk of wound dehiscence.
2. Impaired wound healing. Oxygen is required for collagen formation. Studies demonstrate that edema decreases oxygen diffusion from the capillaries to adjacent tissues, which can in turn retard wound healing. Edema reduction improves oxygen tension and therefore improves collagen production and wound healing.
3. Increased risk of infection. The ability to fight infection is, in part, oxygen dependent. Hypoxia increases the risk of wound infection; decreased oxygen tension reduces leukocyte mediated bacterial killing.
4. Increased risk of thrombosis. The presence of lower extremity edema results in stasis of blood flow and can increase the risk of deep venous thrombosis (DVT) and pulmonary embolism (PE). PE is perhaps the number one cause of preventable hospital deaths with 200,000 deaths annually. DVT is seen often in surgical patients with venous edema, but is seen less often in lymphedema patients.

Patients with lymphedema, lympho-venous edema, and venous insufficiency edema can be operated on successfully. Below are the recommendations for minimizing surgical complications on the edematous limb.

Recommendations for Lymphedema and Lympho-Venous Edema Patients

1) Use CDT to reduce edema to baseline prior to surgery;
2) Consider use of prophylactic antibiotics perioperatively;
3) Consider the use of short-stretch bandaging or compression garments during surgery;
4) Use appropriate compression postoperatively and consider MLD;

Additionally, tissue hypoxia leads to tissue acidosis due to anaerobic cell metabolism, which also decreases leukocyte function. Furthermore, wounds/incisions located in edematous areas are more likely to drain and provide entry portals for bacteria. Bacteria propagate quickly through interstitial fluid planes, which can lead to severe infections.
5) Elevate limb(s) postoperatively;
6) Use absorbable sutures where possible.

**Recommendations for Venous Insufficiency Edema Patients**

1) Reduce edema to baseline prior to surgery.
2) Use prophylactic antibiotics at time of surgery.
3) Use compression immediately postoperatively.
4) Use MLD postoperatively as indicated.

**Reduce Edema to Baseline Prior to Surgery**

For elective cases, it is important to reduce edema to baseline prior to surgery. Reducing lymphedema to baseline can reduce the inflammatory process and may help reduce tissue fibrosis, improve wound healing and reduce risk of infection postoperatively.

For simple venous insufficiency cases, preoperative edema reduction can be achieved in some cases with simply one week of elevation of the extremity. In more severe cases of chronic venous insufficiency (CVI), edema reduction can be achieved with compression such as short-stretch or multilayer compression bandages. For patients whose limbs are reduced to baseline but who are at risk for an exacerbation of edema prior to surgery, it is recommended that the patient be placed in properly fitted stocking(s) or sleeve(s). Garments should be worn preoperatively, such that edema is well controlled on the day of surgery.

For individuals with lymphedema who have not undergone CDT previously, a complete course of CDT is recommended before any elective surgical procedure. If the patient’s lymphedema is stable and at the patient’s baseline, formal treatment may not be required preoperatively; however, self-MLD may be useful.

It is recommended for LE patients to have limb measurements taken preoperatively, thereby establishing a baseline to guide the patient’s postoperative therapy. Ideally, the surgeon should not schedule surgery until the patient is at his/her baseline and all reversible swelling has been reduced.

**Prophylactic Antibiotic Use Perioperatively**

Use of antibiotics immediately prior to surgery is the recommended standard practice in the United States. The National Surgical Infection Prevention Project recommends that antibiotics be given 60 minutes prior to a procedure for maximal antibiotic concentration at time of incision. This has been shown to reduce infection rates. Routine use of antibiotics preoperatively for longer periods of time is not recommended and is discouraged. For non-lymphedematous patients, preoperative antibiotics administration during the days to weeks prior to surgery is therefore discouraged. In this patient population, epithelialization of the wound occurs within 24 hours. It is also recommended not to continue postoperative antibiotics beyond 24 hours postoperatively for routine surgical patients or patients with venous edema.

The use of preoperative antibiotics for lymphedema patients, however, is supported in the literature for patients with history of recent or frequent cellulitis. These patients are at higher risk of perioperative complications. Olszewski and Campisi recommend injectible Bicillin for patients in the week prior to surgery. Olszewski’s rationale is to saturate the tissues which have impaired lymphatic transport with the antibiotic prior to the procedure; this is based upon 20 years experience. Other series do not use antibiotics in the days to weeks prior to surgery and do not report increased infection rates.

While the use of antibiotics for days to weeks preoperatively has little evidence-based literature support, there is anecdotal evidence that antibiotics such as Bicillin may reduce complication rates for lymphedema. Clinical practice varies, however, and some experts recommend other broad spectrum antibiotics for lymphedema patients, such as cephalosporins, quinolones, or mycins rather than Bicillin, for reduced allergic reactions and increased effectiveness.

LE patients have decreased bacterial clearance and higher complication rates of infection than other surgery patients. Therefore, while there is little evidence-based literature on which to base recommendations, some experts recommend antibiotics for days to several weeks after surgery. This can be utilized for patients considered at high risk for developing an infection.

**Use of Compression During Surgery**

If surgery is not being performed on the affected limb, the surgeon should consider use of compression on the lymphedematous limb during surgery. Patients undergoing general anesthesia have lower blood pressure rates, and hypotension can occur due to sedation or blood loss during a procedure. Still, it seems logical that a light compression sleeve, garment or short-stretch compression bandage would prevent limb swelling during the procedure. Use of 20mm hg compression or short-stretch compression for lymphedematous limbs during surgery may reduce the risk of limb swelling. In the event of profound or prolonged hypotension during the procedure, the surgeon and anesthesiologist should have a plan for removing the compression if necessary.

**Judicial Use of IV Fluids**

The use of intravenous (IV) fluid boluses is common during surgical procedures. IV fluid prevents intravascular depletion, and in the case of significant blood loss, gives more intravascular reserve in order to minimize blood pressure fluctuations and stress on the body. Excessive use of IV fluids can lead to greater capillary load and increased demand on the lymphatic system. For a LE patient who has decreased lymphatic reserve function, this can result in significant limb swelling. This is obviously highly dependent on the type of surgery and other circumstances,
but is something that the patient can discuss with their surgeon and anesthesiologist prior to surgery. Use of compression during surgery can blunt significance of this recommendation.

Use of MLD in the Postoperative Period

Manual Lymph Drainage is described in several case studies\textsuperscript{10,12,17}. It is important to initiate lymphedema management as soon as possible. If surgery is performed on an affected limb, any swelling that occurs can increase tension on the incision and may increase the risk of dehiscence. Furthermore, postoperative swelling can increase the risk of lymphorrhea developing in the wound bed, resulting in an increased risk of seroma formation, impaired wound healing, and infection.

In conjunction with MLD, use of compression postoperatively is widely reported for patients receiving surgery on a lymphedematous body part\textsuperscript{6,12,14,17,18}. Therefore, it is recommended that if a lymphedematous limb is operated on, the patient be placed in compression in the immediate postoperative period. If there is an incision on the limb, short-stretch bandages are recommended so there is no disruption of the surgical site. If there is no incision, a compression sleeve, stocking or alternative garment can be used instead. MLD in the postoperative period may improve lymphatic outflow and should be considered especially for any LE patients with increased swelling on the affected limb.

Limb Elevation

Limb elevation is widely reported in the postoperative period\textsuperscript{11,18,19,20}. If short-stretch compression is being used postoperatively this can be safely used in conjunction with limb elevation. Limb elevation is supported in the literature, but may provide minimal benefits if short-stretch compression is used.

Use of Absorbable Sutures

In the case of lymphedema patients, the inflammatory process is known to accelerate fibrosis of tissues. Foreign body reaction is also known to cause a fibrosis type reaction in patients with considerable variability. Non-absorbable sutures have been reported to cause a chronic inflammatory reaction in lymphedema patients\textsuperscript{8}. Avoiding non-absorbable sutures may reduce this risk. However, other studies have used non-absorbable sutures without apparent complications\textsuperscript{14}.

Conclusion

There are many large case studies published which show that patients with lymphedema can have the affected limb operated on successfully. The following may increase successful outcomes:

- Preoperative planning with input of surgeon, patient, and LE therapist is vital to help define a treatment plan;
- Reducing edema preoperatively, when operating on a swollen limb, will reduce the chance of complications and is strongly recommended;
- Use of compression postoperatively and limb elevation are strongly recommended as well;
- MLD preoperatively and/or postoperatively is recommended for lymphedema patients if there is any increased swelling from baseline;
- Use of antibiotics for 1-2 weeks prior to surgery may be beneficial for edema patients with irreversible tissue fibrosis / recent episodes of infection or poor edema control. (Although some physicians make this recommendation, there has yet not been evidence in the literature to support this practice.)
- Use of antibiotics for 1-2 weeks after surgery may be beneficial for lymphedema patients, as there is evidence of decreased bacterial clearance and higher complication rates in these patients.

REFERENCES:

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